METAL CASTING

Project Fact Sheet

Reducing Energy Consumption and Variability in Steel Foundry Operations

Benefits

Energy used in producing steel is nearly ten times the practical minimum. Through the implementation of new technologies, better controls, and improved melting and casting techniques, the industry will be able to reduce energy needs significantly. Estimated benefits include:

- 20% reduction in scrap and material handling
- A reduction in greenhouse gases due to energy savings
- Reducing the process variation will directly result in the reduction or elimination of the need for upgrading operations

Application

The results of this research can be applied throughout the steel foundry industry. Similar technologies have been developed for other manufacturing industries, and one of the goals will be to adapt some existing technologies for the unique environment of the steel foundry. Ultimately, the results of this research could be applied in many types of foundries beyond steel.

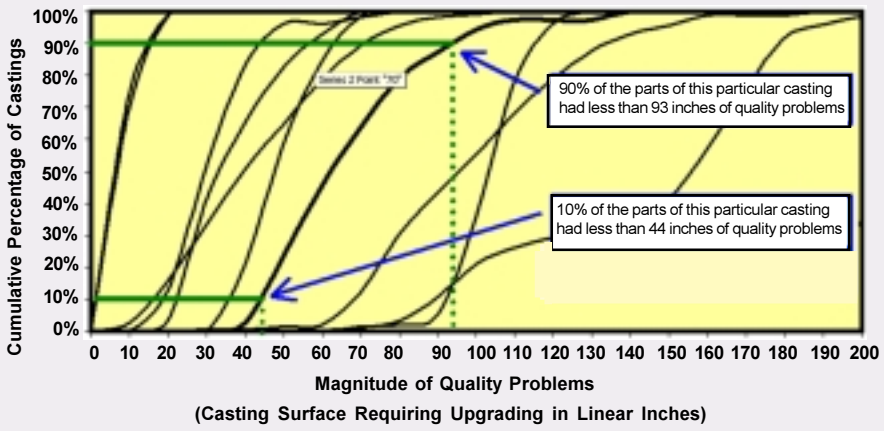
New Guidelines Will Reduce Melting Energy Requirements

Currently, a major challenge for steel foundries is the lack of robust techniques to control product and process variation. Without reliable data in this area, only incremental improvements have been possible. Iowa State University, the Steel Founders' Society of America and industry partners will study ways to improve product and process control. These practices will assist foundries to reduce energy consumption, reduce casting variability, and improve overall efficiency in the steel foundry.

The research team will conduct field studies at steel foundries to measure and monitor process variables and their effect on process variation. Results will be analyzed using statistical techniques to identify areas that will provide the greatest benefits from new technologies, better controls, and improved casting practices.

This project will provide steel foundries with the data and information needed to improve energy and process efficiencies and improve product control. Results will help to reduce scrap and improve operational and energy efficiencies. New and improved steel foundry practices will be developed and instituted at participating foundries. Results will be disseminated to the steel casting industry.

Reducing Quality Problems in Castings



A goal is to reduce the magnitude of quality problems so that 90% of the parts of a casting will reach the level currently achieved by only 10% of the parts of a casting.

Project Description

Goals: The goals of this R&D project are to reduce energy consumption, reduce variability, and improve overall efficiency of steel foundry melting and casting operations. This project will also provide steel foundries with the necessary understanding, technologies, and expertise to make the required melting and operational changes to improve product and process controls.

Progress and Milestones

Planned tasks in this three-year project include:

- **Process and Literature Review**– A literature review will be conducted to study any previous research in the areas of process variation reduction, or process variation measurement, in the metal casting industry. Companies will be surveyed on the variability of their processes. Based on previous experience on the Metal Casting Industry of the Future "Re-Engineering Casting Production Systems" project, it is known that little quantitative data in these regards exist.

- **Development of Casting Assessment Systems**– During the first four months of the project, researchers will start investigating potential methods and technologies for assessing casting variation. Some potential methods include measuring the load required on grinders or integrating meters on welding machines. This may be one way to assess the amount of material that needs to be removed from a casting, which would not be easily biased by the operator.

- **Field Studies**– It is planned to conduct field studies at about 16 foundries over the three-year project to study the variation of casting processes. The focus of these field studies will be to quantify the amount of process and product variation. With this data, root cause analysis will be conducted to identify and cure the source of variation. During the second and third years of the project, efforts will be directed towards integrating the assessment methodologies into industry production and information systems. This is designed to prove to the industry the value and usability of the system.

- **Laboratory Modeling and Experimental Studies**– As information is uncovered during the field trials, data analysis and experiments will be conducted in support of the variation of casting operations work. The analysis of the cross company data will be used to develop schemes to minimize process variation.

- **Improved Production Scheduling**– One of the unplanned outcomes of the Metal Casting Industry of the Future "Re-Engineering Casting Production Systems" project at Iowa State University was initial development of scheduling tools to assist foundries to develop production schedules. Enterprise software used by the industry fails to address this concern. This project will continue to develop this software.

- **Improved Practices/Equipment Field Trials**– Based on the results from process review, initial field studies and lab investigations, new and improved steel foundry practices will be developed and implemented in participating foundries.

Project Partners

Iowa State University
Ames, IA

Steel Founders' Society of America, Barrington IL
Atchison Steel Casting & Machining, Atchison, KS
Durametal Corporation, Muncy, PA
Eagle Alloy, Inc., Muskegon, MI
Grede Foundries, Inc., Milwaukee, WI
Hendrix Manufacturing Co., Inc., Mansfield, LA
Harrison Steel Castings Company, Attica, IN
Maynard Steel Casting Company,Milwaukee, WI
ME International, Inc, Duluth, MN
Missouri Steel Castings, Joplin, MO
Monett Steel Castings, Monett, MO
Spuncast, Inc., Watertown, WI
Varicast, Inc., Portland, OR
Waukesha Foundry Co. Inc., Waukesha, WI
West Michigan Steel Foundry, Muskegon, MI

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